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**APPLICATION FOR UNITED STATES PATENT**

**TITLE:**

A LIP GASKET FOR A COOKING APPLIANCE AND A COOKING APPLIANCE  
EQUIPPED WITH SUCH A GASKET

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**PRIORITY CLAIM**

This patent application is a U.S. National Phase of International Application No. PCT/FR2004/002648, having an International Filing Date of October 15, 2004, which 25 claims priority to French Patent Application No. FR 0313935, having a Filing Date of November 27, 2003, the disclosures of which are incorporated herein by reference in their entirety.

## **FIELD OF THE INVENTION**

The present invention relates to the general technical field of household cooking appliances comprising a bowl and a lid between which a gasket is interposed for providing sealing between the lid and the bowl during the cooking process, and in particular steam-tight sealing when the appliance is a pressure-cooking appliance of the pressure cooker type for cooking food contained in the bowl under steam pressure.

The present invention relates more particularly to a lip gasket designed to be mounted between the lid and the bowl of a cooking appliance for the purpose of providing sealing between said lid and said bowl, said gasket comprising at least first and second lips, interconnected by a heel, said lips and said heel being such that, when the lips are brought together, they are suitable for defining a closed interstitial space.

The present invention also relates to a cooking appliance equipped with such a gasket.

## **BACKGROUND OF THE INVENTION**

It is already known that a cooking appliance, such as a pressure cooker, can be equipped with an annular sealing gasket made of a deformable elastomer material in order to provide sealing between the bowl and the lid when the appliance is put under pressure, so as to form a leaktight cooking enclosure.

The gaskets that are usually implemented in the field of pressure cookers are channel-section, the web of the channel section forming a heel from which first and second lips extend that form respective ones of the flanges of the channel section.

Although such known gaskets are generally satisfactory, they do however suffer from certain drawbacks.

In certain situations, the pressure cooker can be subjected to suction, i.e. its internal pressure can be lower than atmospheric pressure. Such suction can occur when, after a pressure-cooking cycle, the pressure cooker is cooled without being decompressed, i.e. without putting the inside of the enclosure into communication with the outside.

Such suction in the cooking enclosure gives rise to the lid being sucked against the bowl, and to the lips of the gasket being sucked together.

When the user subsequently brings the pressure prevailing inside the enclosure to atmospheric pressure, by putting the inside of the enclosure into communication with the outside, the user can then separate the lid from the bowl without any difficulty.

However, it is frequently observed that, in spite of the inside of the enclosure being put into communication with the outside, the two lips of the gasket remain stuck together over the entire periphery of the gasket. In such a stuck-together configuration, the gasket naturally has an abnormal shape which makes the seal unsuitable for sealing the cooking appliance during a subsequent cooking cycle.

That phenomenon of the lips sticking together seems to result from an annular suction cavity being formed between the two lips when the appliance is subjected to suction, the cavity being made leaktight by the lips being in contact with each other.

Most users are generally unaware of the causes of this sticking-together phenomenon, in particular when said users are not even aware that their pressure cookers have, for a time, been subjected to suction.

A user who finds the gasket stuck together in this way generally thinks the gasket has been damaged during cooking and/or has a manufacturing defect or a design fault. Less frequently, when the user understands that a phenomenon of suction is the cause of the lips of the gasket sticking together, said user might attempt to separate said lips by inserting a pointed tool, such as screwdriver, into the join between the two lips.

However, such action is unsatisfactory in that it is not easy to perform and it is unsafe since it can give rise to the gasket being damaged or to the user being injured.

Finally, it should be noted that the problem of the lips of the gasket sticking together is particularly critical for appliances whose lid is inserted into the bowl by sliding, such a lid having a drop skirt that is encircled laterally by the wall of the bowl when the lid is brought onto said bowl. It seems that the feature of the lid sliding in the bowl, which feature is specific to that particular type of pressure cooker, can flatten the gasket considerably, thereby increasing the risk of the lips sticking together.

## SUMMARY OF THE INVENTION

The features of the invention consequently aim to remedy the above-mentioned drawbacks of the prior art, and to propose a novel lip gasket designed to be mounted between the lid and the bowl of a cooking appliance, which gasket makes it possible to avoid any phenomenon of the lips sticking together, while also being of a design that is particularly simple and inexpensive.

Another feature of the invention is to propose a novel lip gasket designed to be mounted between the lid and the bowl of a cooking appliance and that is particularly easy to manufacture.

Another feature of the invention is to propose a novel lip gasket designed to be mounted between the lid and the bowl of a cooking appliance and that has an appearance that is very close to the appearance of a standard gasket of the prior art.

5 Another feature of the invention is to propose a novel cooking appliance, and in particular a novel cooking appliance with an internally-received lid that is particularly reliable and stable even after it has been subjected to suction.

10 The features assigned to the invention are achieved by means of a lip gasket designed to be mounted between the lid and the bowl of a cooking appliance for the purpose of providing sealing between said lid and said bowl, said gasket comprising at least first and second lips, interconnected by a heel, said lips and said heel being such that, when the lips are brought together, they are suitable for defining a closed interstitial space, said gasket being characterized in that it is provided with at least one geometrical discontinuity suitable for acting, when the lips are brought together, to provide at least one path for putting said interstitial space into communication with the outside.

15 The features assigned to the invention are also achieved by means of a cooking appliance comprising a bowl and a lid that is designed to be received on said bowl to form a cooking enclosure, a gasket of the invention being mounted between said bowl and said lid.

## 20 BRIEF DESCRIPTION OF THE DRAWINGS

Other features and advantages of the invention will appear in more detail on reading the following description with reference to the accompanying drawings which are given by way of non-limiting and illustrative example, and in which:

25 Fig. 1 is an overall perspective view of a pressure-cooking appliance having an internally-received lid and in accordance with the invention;

Fig. 2 is a section view of a detail of the appliance shown in Fig. 1, the appliance being equipped with a first exemplary embodiment of the lip gasket of the invention;

Fig. 3 is a fragmentary cross-section view of a detail of the lip gasket shown in Fig. 2;

30 Fig. 4 is a diagrammatic view from below, showing the gasket of Fig. 3;

Fig. 5 is a diagrammatic view from below, showing a portion of the gasket of Figs. 2 to 4 when it is subjected to a force that presses its lips together;

Fig. 6 is a cross-section view of a gasket of the invention whose lips are brought together under the effect of external stress, e.g. resulting from the bowl being subjected to suction;

5 Fig. 7 is a diagrammatic view from below, showing a second exemplary embodiment of the gasket of the invention;

Fig. 8 is a diagrammatic view from below, showing a third exemplary embodiment of the gasket of the invention;

10 Fig. 9 is a fragmentary cross-section view of a detail of a fourth exemplary embodiment of a lip gasket of the invention;

Fig. 10 is a diagrammatic view from below, showing a portion of the gasket of Fig. 9, when it is subjected to a force pressing its lips together; and

Fig. 11 is a diagrammatic view from below, showing the gasket of Figs. 9 and 10.

## DESCRIPTION OF THE INVENTION

15 The invention relates to a lip gasket 1 designed to be mounted between the lid 2 and the bowl 3 of a cooking appliance 4 which is preferably designed for household use.

The gasket 1 provides sealing between the lid 2 and the bowl 3, so that the cooking appliance 4 thus forms a cooking enclosure that is substantially closed when the lid 2 is received on the bowl 3, so as to enable food placed inside the enclosure, in the bowl 3, to be cooked in a confined atmosphere.

Advantageously, the gasket 1 is annular in general shape and, preferably, its outline is substantially circular. However, it is quite possible, without going beyond the ambit of the invention, for the gasket 1 to have some other shape, and in particular not to extend around a closed outline.

25 The gasket 1 of the invention comprises at least first and second lips 1A, 1B interconnected by a heel 1C. It is also quite possible for the gasket 1 to have more than two lips without going beyond the ambit of the invention.

As is well known to the person skilled in the art, the lips 1A, 1B are flexible, in order to perform their sealing function in co-operation with the heel 1C.

30 Advantageously, the first and second lips 1B, 1C are made of a flexible material such as an elastomer material.

More preferably, the entire gasket 1 is made of an elastomer material and in one piece, the first and second lips 1A, 1B being formed integrally with the heel 1C.

Advantageously, the cooking appliance 4 of the invention is a pressure-cooking appliance such as a pressure-cooker. In which case, and as described below, the lip gasket 1 is mounted between the lid 2 and the bowl 3 so as to provide pressure-tightness between said lid 2 and said bowl 3, so that the appliance 4 forms a substantially steam-tight cooking enclosure.

Conventionally, the bowl 3 forms a cooking receptacle and preferably it is substantially circularly symmetrical about a vertical axis X-X'. Below, the adjectives "vertical" and "axial" are relative to this axis X-X'.

For example, the bowl is made of a metal material such as stainless steel, and it is provided with a side wall 3A extending substantially in the vertical direction from the bottom 3B which is, for example, substantially circular.

The side wall 3A extends from the bottom 3B to an entry rim 3C defining a top opening via which the user can insert food for cooking in the bowl 3, and also suitable for receiving the lid 2. Thus, when the appliance 4 is in the operating configuration, i.e. when the lid 2 is received on the bowl, the bowl 3 extends substantially in the axial direction X-X' between the bottom 3B and the lid 2.

The entry rim 3C is preferably in the form of a rolled-over or a folded-over edge.

The side wall 3A has an inside face 30, situated facing the inside of the bowl 3.

The bowl 3 can also have graspable members such as handles 3D, 3E, of which there are preferably two, e.g. fastened to the bowl 3 in diametrically opposite manner.

The gasket 1 of the invention is preferably designed to be mounted in a cooking appliance 4 whose lid 2 has a drop skirt that is received inside the bowl, i.e. the lid 2 is inserted into the bowl 3 so as to be surrounded laterally thereby, as shown in Figs. 1 and 2.

Preferably, the lid 2 thus has a top wall 2A, e.g. in the general shape of a substantially convex disk, with the skirt 2B extending substantially vertically downwards from its periphery, thereby forming a band that is symmetrical about the axis of symmetry X-X'. The drop skirt 2B is designed to be inserted into the bowl 3 when the lid is received thereon. This means that the drop skirt 2B is then substantially surrounded by the inside face 30 of the side wall 3A of the bowl 3; hence the lid 2 can be referred to as "a lid having an internally-received drop skirt".

Preferably, the gasket 1 is interposed between the drop skirt 2B and the side wall 3A, as shown in Fig. 2. To this end, in cross-section, the drop skirt 2B advantageously presents a setback forming a recess for receiving the gasket 1. For example, said setback

is formed by the combination of a first edge 5 extending substantially parallel to the vertical direction X-X' when the lid 2 is in position on the bowl 1, of a second edge 6, forming an edge extending inwardly from the first edge 5 in a manner substantially perpendicular thereto, and finally of a third edge 7 extending substantially downwards and outwards when the lid 2 is placed on the bowl 1, i.e. in a direction that slants slightly relative to the vertical direction X-X'. The third edge 7 thus forms a ring serving to be encircled by the gasket 1, while the second edge 6 forms an abutment edge for said gasket 1.

In other words, when it is mounted in the appliance 4, the gasket comes to clamp around the third edge 7 via its first lip 1A, while the heel 1C comes into plane abutment against the second edge 6.

As shown in the figures, the gasket 1 is advantageously of channel-section, each of the flanges of the channel section forming a respective one of the first and second lips 1A, 1B, with the web of the channel section forming the heel 1C.

Advantageously, the gasket 1 is shaped in a manner such that, when it is mounted in the operating position between said lid 2 and said bowl 3, as shown in Fig. 2, the first and second lips 1A, 1B extend towards the bottom 3A of the appliance.

Advantageously, as is also shown in Fig. 2, the first lip 1A lies substantially within a first truncated cone whose vertex lies substantially on the axis X-X', above the third edge 7. Advantageously, and as is shown in particular in Fig. 2, the second lip 1B lies substantially within a second truncated cone whose vertex lies substantially on the axis X-X', below the third edge 7.

Preferably, the gasket 1 is thus substantially circularly symmetrical in shape, corresponding to its section being rotated about an axis that is substantially parallel to the first flange and/or to the second flange of the channel section. In the particular example of the gasket 1 shown in the figures, the shape of the gasket corresponds to its section being rotated about the axis X-X', the web of the channel section, from which the heel 1C is generated, being substantially perpendicular to the axis X-X'. Thus, the gasket 1 of the invention preferably has a heel 1C which lies in a single plane from which the following are generated: a first substantially circular band that corresponds to the first lip 1A; and a second substantially circular band that is concentric with the first circular band and that forms the second lip 1B.

However, it is quite possible for the shape of the gasket 1 to correspond to its section being rotated about the axis X-X', with its web, from which the heel 1C is

generated, being substantially parallel to the axis X-X'. In such a variant, the lips of the gasket extend radially inwards.

Like the gaskets of the prior art, the lips 1A, 1B, and the heel 1C of the gasket 1 of the invention are such that they are suitable for defining a closed interstitial space 100 when the lips 1A, 1B are brought together, e.g. under the effect of the enclosure being subjected to suction (cf. Fig. 6).

According to an important characteristic of the gasket 1 of the invention, said gasket is provided with at least one geometrical discontinuity 80 that is suitable for acting, when the lips 1A, 1B are brought together, to define at least one path 9, 90 for putting said interstitial space 100 into communication with the outside.

In other words, the discontinuity 80 interrupts the geometrical regularity of the gasket 1 at a point, and, in particular locally modifies the outline of the cross-section of the gasket 1. The cross-section of the gasket 1 can thus advantageously be identified with the geometrical continuity of the gasket 1, which continuity is interrupted by the presence 15 of the geometrical discontinuity 80.

The geometrical discontinuity 80 is thus a feature of the shape of the gasket 1 that makes it possible to prevent the lips 1A, 1B from fitting together snugly and continuously when they are pressed together under external stress, e.g. stress generated by suction.

The geometrical discontinuity 80 thus makes it possible to guarantee the presence 20 of one or more leakage gaps at the contact interface between the lips 1A, 1B when said lips are stuck together.

By means of the presence of the geometrical discontinuity 80, the interstitial space 100 can never become leaktight, which can occur in the prior art. This prevents the problem of the lips 1A, 1B continuing to stick together after the suction has disappeared.

25 The geometrical discontinuity 80 is advantageously situated in or on the gasket 1 so as to find itself at the contact interface between the lips 1A, 1B when said lips are brought together, e.g. under the effect of the enclosure being subjected to suction.

Preferably, the geometrical discontinuity is made by adding or removing material. More precisely, the discontinuity advantageously results from localized addition(s) or 30 localized removal(s) of material to or from the gasket 1 itself, e.g. at one or more lips 1A, 1C or at the heel 1C.

In a first design option, corresponding to the variants of Figs. 2 to 7, the geometrical discontinuity 80 comprises distance-keeper means 8 for keeping said first and lips 1A, 1B apart, said means 80 being interposed between the first and second lips 1A,

1B so as to prevent said lips 1A, 1B from being pressed together, at least locally (i.e. at least over a portion of their peripheries).

The function of the distance-keeper means 8 is thus to guarantee the presence of some minimum spacing between the lips 1A, 1B, at least locally. Thus, even if the lips 5 1A, 1B are pressed together under the effect of the cooking enclosure being subjected to suction, a path-forming gap 9 (cf. Fig. 5) is always provided at each of certain places around the gasket 1, so as to prevent the lips 1A, 1B from being pressed continuously and uniformly together over their entire peripheries, which could cause a leaktight chamber to be formed between the lips 1A, 1B, and the heel 1C.

10 Advantageously, the distance-keeper means 8 comprise at least one local bead of material 8A situated in the space between the lips 1A, 1B when the gasket 1 is at rest. Preferably, each local bead 8A is formed integrally with the first lip 1A and/or with the second lip 1B. In other words, each local bead 8A is advantageously manufactured simultaneously with the lip from which it extends.

15 Preferably, as shown in the figures, the gasket 1 is provided with a plurality of local beads 8A which are spaced apart, preferably uniformly. By way of example, when the gasket 1 is circular in shape, it is possible to provide four beads 8A, spaced apart at 90° intervals about the axis of symmetry of the gasket 1.

Advantageously, each local bead 8A forms a projection or protuberance extending 20 from the first lip 1A (or from the second lip 1B) towards the second lip 1B (or towards the first lip 1A), as shown in Figs. 4 and 7.

In the variant exemplary embodiment shown in Figs. 2 to 5, each local bead 8A projects from the first lip 1A towards the second lip 1B, but without coming into contact therewith when the gasket 1 is at rest, i.e. when it is not subjected to any mechanical 25 stress. Any contact occurs only when the lips 1A, 1B are pressed together, e.g. under the effect of the enclosure being subjected suction. In this configuration, shown in Fig. 5, each local bead 8A is dimensioned to form a local gap 9 between the lips 1A, 1B that is of size sufficient to enable the interstitial space to be put into communication with the outside, and thereby to prevent the lips 1A, 1B from sticking together permanently, i.e. in 30 a manner that continues after the suction conditions have disappeared.

Preferably, as shown in Figs. 2 to 5, each bead 8A is formed by a rib extending over the inside face 10A of the first lip 1A, i.e. over the surface situated facing the second lip 1B.

For reasons of simplicity, the description below is limited to the ribs extending from the first lip 1A, it being understood that it is quite possible, without going beyond the ambit of the invention, for said ribs to extend from either of the first and second lips 1A, 1B.

5 Preferably, each rib extends from the heel 1C over substantially the entire length of the first lip 1A in cross-section, as can be seen in particular in Figs. 2 and 3. However, it is quite possible for each rib to extend over a portion only of the width of the first lip 1A, in the vicinity of the free end thereof, i.e. in the vicinity of its side remote from its side connected to the heel 1C.

10 The Applicant has thus shown that the presence of mere ribs, i.e. of thin lines projecting from the surface of either one of the lips 1A, 1B suffices to prevent the above-described phenomenon of the lips sticking together from occurring, i.e. to prevent a substantially leaktight chamber from being formed between the lips 1A, 1B, and the heel 1C.

15 In the variant shown in Fig. 7, each local bead 8A forms a spacer between the lips 1A, 1B. In other words, in this variant, each bead 8A interconnects the first lip 1A and the second lip 1B directly, and thus forms a bridge of material between the lips.

20 In other variant exemplary embodiment, shown in Fig. 5, each local bead of material 8A extends between the lips 1A, 1B from the heel 1C, but without being in contact with either of said lips 1A, 1B when the gasket 1 is at rest. In this variant, the distance-keeper means 8 are thus united with the heel 1C only, and are independent of the lips 1A, 1B.

25 In a second design option, corresponding to the variant shown in Figs. 8 to 10, the geometrical discontinuity 80 comprises a recessed element that is concave, such as a groove, rather than a projecting and convex element.

More precisely, each lip 1A, 1B respectively has a an inside face 10A, 11A and an opposite, outside face 10B, 11B, the inside faces 10A, 11A facing each other, the geometrical discontinuity 80 comprising at least one notch 80A provided in the inside face 10A, 11A of one of the lips 1A, 1B.

30 As shown in the figures, the notch 80A opens out to the free side of the lip 1A in which it is provided (i.e. the side opposite from the side of the lip that is connected to the heel), and said notch is dimensioned to be of size that is sufficient to pass air into the inter-lip space regardless of the relative position of said lips.

The notch 80A thus forms a trench or groove extending in the surface of the inside face 10A, i.e. over only a fraction of the thickness of the lip 1A in question.

The notch 80A can have any type of cross-section, and, for example, its cross-section can be rectangular, triangular (cf. Fig. 11, on the left of the drawing), or curved, this list naturally being in no way limiting.

It is also possible to make provision for the notches 80A to be provided in corresponding pairs in respective ones of the lips 1A, 1B as can be seen in Fig. 10, on the right of the drawing. In which case, the path 90 is formed by the two notches situated facing each other co-operating with each other.

10       The invention operates as follows.

Firstly, the user inserts the lid 2 into the bowl 1. The skirt 2B co-operating with the inside face 30 of the bowl 3 makes it possible for the lid 2 to be self-guided relative to the bowl 3.

In addition, when the lid is inserted, contact between the lid 2 and the bowl 3 takes place only between the drop skirt 2B and the side wall 3A of the bowl 3, the gasket 1 not adhering to the bowl 3, thereby facilitating insertion of the lid 2.

Once the lid 2 is inserted, the second lip 1B folds against the inside face 30 of the side wall 3A. The user then locks the lid 2 to the bowl 3, e.g. by means of a jaw locking mechanism 40 that is well known per se. In this locked configuration, the gasket 1 is flattened between the third edge 7 and the inside face 30 of the inside wall 3A. It thus provides sealing of the enclosure formed by the bowl 3 and the lid 2, by means of the leaktight contact established firstly by the first lip against the third edge 7, and secondly by the second lip 1B against the inside face 30 of the side wall 3A.

25       The appliance 4 can thus be brought up to its set pressure. During this pressure build-up and pressure-cooking stage, sealing is maintained by means of the flexibility of the lips 1A, 1B which accommodate or compensate for any displacement or deformation of the lid 2 and/or of the bowl that might occur under the effect of the pressure build-up.

If the user cools the appliance, e.g. by placing it under a jet of cold water, without first putting the inside of the enclosure into communication with the outside, a 30 phenomenon of suction can occur inside the enclosure.

Under the effect of the suction, the lid 2 is sucked substantially vertically into the bowl 3 towards its bottom 3A. Under the effect of this suction, the first and second lips 1A, 1B are pressed together.

However, by means of the presence of the distance-keeper means 8 formed by the ribs extending from the first lip 1A, local paths 9 are always provided between said lips, thereby preventing a suction chamber from being formed in the interstitial space 100.

The principle is analogous when, instead of (or in addition to) the distance-keeper means 8, one (or more) notch(es) 80A is/are provided, except that it is the notches themselves that form the paths 90 directly.

Therefore, when the lid 2 can be removed from the bowl 3 by the user, after the user has put the inside into communication with the outside, the gasket 1 automatically, by means of a well known resilient return or "shape memory" phenomenon, resumes its usual rest shape, i.e. its channel section shape.

The user thus has an appliance 4 that is ready to be used again, the gasket 1 having retained substantially no trace of being subjected to suction.

The invention may be used in manufacturing sealing gaskets for household cooking appliances, and in particular for pressure-cooking appliances of the pressure cooker type.